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Identifying Earnings Management Using Changes in Asset Turnover and Profit Margin

A research report submitted to the

SCHOOL OF ACCOUNTING

Faculty of commerce, law and management

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Master of Commerce

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Abstract

This study assesses the ability of Jansen, Ramnath & Yohn (2012) diagnostic, which is based on the relationship between the change in the asset turnover ratio and profit margin ratio, to distinguish between those firms suspected of manipulating reported financial figures by means of earnings management (EM) and firms that have not attempted earnings management. The study aims to determine whether, as suggested by Jansen et al (2012), the change in the asset turnover ratio and profit margin ratio as well as the direction of the change, can potentially indicate EM. In addition, the study aims to determine whether this new, simplistic diagnostic is incrementally useful to discretionary accruals in identifying EM. The sample of suspected EM firms was obtained from a study conducted by Rabin & Negash (2012), using kernel density estimation (Lahr, 2014). The results of this research suggest that Jansen et al.'s (2012) diagnostic is a useful indicator for identifying firms that might have manipulated reported financial figures through the use of earnings management. The study however shows that, due to weaknesses in either the diagnostic, in that it is limited in its ability to identify EM through sales, or in the method used to obtain the sample, this diagnostic is not incrementally useful to discretionary accruals models in identifying EM. Instead it should be used in conjunction with other models.

DECLARATION

I declare that this dissertation is my own original work and that all sources have been accurately reported and acknowledged. It is submitted in partial fulfilments of the requirements for the degree of Masters of Commerce to the University of Witwatersrand, Johannesburg. This research has not been submitted for any degree or examination at this or any other university.

_____ _____

Jodi Lee Harebottle Date

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DEFINITION OF TERMS

The following is a summary of important terms used in this report:

EM1 band- This band of earnings after tax, deflated by number of shares in issue at the end of the reporting period, includes firms suspected of managing their earnings. In this research the EM 1 band is identified using KDE (Lahr, 2014).

EM 0 band- This band of earnings after tax, deflated by number of shares in issue at the end of the reporting period, includes firms, to the left and right of the EM1 band, suspected of not having managed their earnings. In this research the EM 0 firms are identified using KDE (Lahr, 2014).

Chapter I – Introduction

To be useful, financial reporting must provide users with information which faithfully represents the financial position and performance of the entity in order to guide their decisions (International Accounting Standards Board, 2012b, Goel, 2012). The conceptual framework thus requires faithful representation of financial information as one of its qualitative characteristics (Cohen, Holder-Webb, & Wood, 2011; Jansen et al., 2012). Earnings management (hereafter referred to as EM) impairs the reliability and faithful representation of the financial information and ultimately results in the misallocation of resources and overpricing (Healy & Wahlen, 1999). However, because the nature of EM is to mislead, its detection is difficult. Although models such as the Jones (1991) and Modified Jones model (Dechow, Sloan and Sweeney, 1995) have been developed, these models are difficult to estimate and not completely accurate in identifying EM. An alternative tool has therefore been suggested by Jansen et al. (2012) based on the assumptions underlying the Du Pont analysis that sales is a driver of both the company's income and its investment. Jansen et al. (2012) this suggested that the relationship between the change in the asset turnover ratio [($Sales_t$/Net operating $Assets_{t)}$ - ($Sales_{t-1}$/Net operating $Assets_{t-1}$)] and the change in the profit margin ratio [(Operating $Income_t$/$Sales_{t)}$- (Operating $Income_{t-1}$/$Sales_{t-1}$)] could be used as a diagnostic for EM. The purpose of this research is to consider whether there is an association between the Jansen et al. (2012) diagnostic and EM in a South African context.

EM, the focus of this research, is defined by Healy and Wahlen (1999) as occurring "*when managers use judgment in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company, or to influence contractual outcomes that depend on reported accounting numbers*.'' This definition highlights two aspects of EM, the manipulation of accrual accounting and contract structuring or "real" EM. Real EM is achieved through manipulating the underlying transactions or by deferring transactions. This form of EM is however considered to be the less common form of EM and is thus not included in the scope of this research (Peasnell, Pope, & Young, 2004).

EM is not directly observable as managers use EM to mislead stakeholders about the underlying performance; and as a result their actions are concealed and EM is difficult to detect (Jansen et al., 2012). EM is costly to stakeholders because overstated profits will lead to share mispricing (Collingwood, 2001; Graham, Harvey, & Rajgopal, 2005). In addition, concealing the true financial position of the entity will prevent stakeholders from being able to challenge management's stewardship function. Creditors also risk costs when they grant loans or offer favourable interest rates based on a manipulated financial position. Finally, EM poses the risk of litigation to auditors and reputational damage to analysts (Dechow, Weili, Larson, & Sloan, 2011). Overall, financial manipulation damages investor confidence and market efficiency as seen in recent corporate scandals (Watson and Rossouw, 2012).

Prior research has developed various models such as the Jones (1991) and Modified Jones model (Dechow et al., 1995), to identify the discretionary component of accruals managed component of accruals. These models are however difficult to estimate and display low power in detecting EM (Dechow et al., 1995; Degeorge, Patel, & Zeckhauser, 1999; Phillips, Pincus, & Rego, 2003).

Jansen et al. (2012) has therefore suggested a new diagnostic based on the relationship between the change in the asset turnover ratio and the change in the profit margin ratio based on the assumptions of the Du Pont analysis. Jansen et al. (2012) expect that the net operating income in the Statement of Profit and Loss and Other Comprehensive Income (formerly known as the Income Statement) and net operating assets on the Statement of Financial Position (formerly known as the Balance Sheet), should vary directly in relation to a firm's sales. Thus, in a stable growth environment and in the absence of sales manipulation, the asset turnover (ATO) and profit margin (PM) ratio should remain constant over time. Consequently, Jansen et al. (2012) proposed that any movements in either the ATO or PM ratio should be investigated as they may indicate EM. In addition, Jansen et al. (2012) suggested that EM activities had an inverse effect on both ratios. For example, the manipulation of the provision for doubtful debts, increases operating income and increases accounts receivable, and thus net operating assets, while leaving sales unchanged. The PM ratio thus increases, while the ATO ratio decreases. Jansen et al. (2012) thus proposed that an inverse relationship between the change in ATO and the change in PM could signal EM and

that this new diagnostic, based on the movement in ATO and PM, could prove useful in EM identification (Jansen et al., 2012).

In order to test EM diagnostics a sample of suspect EM firms must be identified. Prior research has used two broad approaches. The first is to use an a priori reason to identify suspected EM firms. For example Dechow, Larson and Sloan's (2011) sample of suspected EM firms comprised of firms requested by the SEC to restate earnings. The second approach is to analyse earnings distributions for a discontinuity at zero. In the South African context, the Dechow et al. (2011) approach is not appropriate as Watson & Rossouw (2012) found only 38 restatements between 1 September 2002 and 30 September 2010, of which only 23 related to possible EM activities. Therefore in this research, suspected EM firms are identified by searching for a discontinuity in the earnings distribution.

The Burgstahler and Dichev (1997) method is founded upon the transaction cost theory which states that the cost of accessing and analysing financial information is considered to be high. This results in at least some users basing decisions on heuristic cut-offs. Secondly, prospect theory, as postulated by Kahneman and Tversky (1979), suggests that decision-makers assess information about a firm's gains and losses based on a specific reference point such as a heuristic cut-off of earnings as opposed to an analysis of an entities wealth. Therefore Burgstahler and Dichev (1997) hypothesised that managers will manage earnings to avoid reporting losses.

Burgstahler and Dichev (1997), using histograms constructed on preselected binwidths, found a discontinuity at zero in the distribution of profits, deflated by market value of equity at zero. The Burgstahler and Dichev (1997) reference distribution of no-EM is the number of observations in the binwidths adjacent to zero. They report an unusually low number of small loss making firms and an unusually high number of small profit making firms. Because the number of observations in the vicinity of zero were significantly different from the number of observations in the adjacent binwidths this was assumed to be evidence of EM to avoid report a loss.

Bollen and Pool (2009) and Lahr (2014) criticise the Burgstahler and Dichev (1997) method on three grounds, namely the researcher selected bandwidths, the assumption that the discontinuity is only at zero and the linear relationship between the bandwidths around zero and the adjacent bandwidths. Lahr (2014) thus suggested a

more robust, non-parametric method, known as kernel density estimation (KDE), in order to determine the expected number of observations or reference distribution (Bollen and Pool, 2009; Lahr, 2014). KDE identifies a reference distribution of earnings without manipulation, against which the empirical distribution can be compared, in order to identify discontinuities. EM1 firms are identified at the point of maximum difference between the two distributions. KDE is however dependent on two variables, the kernel chosen and the kernel bandwidth (Lahr, 2014). Lahr (2014) thus addresses the weaknesses present in the prior models by proposing the use of an Epanechnikov kernel and a process of bootstrapping to determine the optimal interval.

Durtshi and Easton (2005) further criticised the deflator used by Burgstahler and Dichev (1997) and found that the market value, and similarly, total assets differed between profit or loss making firms. These deflators thus have an effect on the distribution. An alternative deflator, number of shares in issue at year end, was however found not to systematically differ between profit or loss making firms. The number of shares is thus considered to be a reliable deflator to use in developing the earnings distribution and will be used in this research (Lahr, 2014).

This research identifies suspected EM firms from all JSE listed firms between 2000 and 2010, using KDE. The research then tests if there is an inverse relationship for delta ATO and delta PM and whether they are significantly larger for firms suspected of EM when compared to non-EM firms as hypothesised by Jansen et al's. (2012). After completion of this analysis, logistic regressions are used to explore whether there is an association between delta ATO, delta PM and a combination of these variables with EM. This study thus evaluates the diagnostic proposed by Jansen et al. (2012) in South Africa which is an emerging market. Finally this research, identifies whether the delta ATO and delta PM diagnostic is incrementally useful to MJ discretionary accruals in identifying suspected EM firms.

1.3 Hypotheses

The following hypotheses will be tested in this research:

Hypothesis 1: delta ATO and delta PM ratios have an inverse relationship and are significantly larger in suspected EM firms as compared to non- EM firms

Hypothesis 2: The following associations are hypothesised;

a) There is an association between delta ATO and EM.
b) There is an association between delta PM and EM.
c) There is an association between delta ATO and delta PM and EM.

Hypothesis 3: Individually, and in combination, the delta ATO and delta PM are incrementally useful to Modified Jones discretionary accruals in identifying suspected EM firms.

1.4 Significance of the study

EM is costly to all stakeholders and it is thus important to detect and prevent it (Clikeman, 2003; Collingwood, 2001; Dechow & Skinner, 2000). EM is however difficult to detect and quantify. This research aims to assess the effectiveness of the more simplistic, readily observable delta ATO and delta PM diagnostic proposed by Jansen et al. (2012) in identifying EM. If found to be effective, the delta ATO and delta PM diagnostic will prove useful to all stakeholders as the simplicity with which this diagnostic can be calculated and the accessibility of the information it requires results in it enabling identification of potential EM with relative ease.

1.5 Assumptions, Limitations and Delimitations

This research will consider EM achieved purely through the manipulation of accruals and will not consider real EM. Furthermore, the research will only focus on those companies suspected of managing earnings upwards with the management objective of avoiding a loss, identified using KDE. Firms suspected of downwards EM are therefore outside the scope of this research. The sample includes only South African listed companies, excluding mining companies and banks since the regulatory environment in which they operate, as well as the differing accounting practices under which they operate, affect their financial reporting structures and practices to such an

extent as to make comparisons with other sectors unreliable. The results of this study can therefore not be generalised to foreign, mining or financial services companies (Jansen et al., 2012).

Finally, Jansen et al. (2012) identified two limitations in the use of the delta ATO and delta PM diagnostic. When a firm's investment does not grow in a stable manner, the ATO and PM ratios could change over time due to growth as opposed to EM. Thus this research, as with Jansen et al.'s (2012) research, assumes a reasonably constant growth in investment. Secondly, Jansen (2012) noted that the delta ATO, delta PM diagnostic assumes that expenses, not sales, are the source of manipulation. In the presence of sales manipulation, the diagnostic will only prove useful if the profit margin on the managed sales is greater than that on the unmanaged sales and the asset turnover on the managed sales is less than that of the unmanaged sales (Jansen et al., 2012). It is thus acknowledged that this diagnostic will only identify EM through sales in limited circumstances.

The remainder of this report is structured as follows:

Chapter 2 deals with the review of previous literature on this research topic. Chapter 3 describes the research methodology. Chapter 4 discusses the results of the research. Finally, Chapter 5 presents the conclusions drawn from the results of this research and its analysis.

Chapter II – Literature Review

2.1 Background

This literature review will begin by defining EM and evaluating its occurrence. It then briefly assesses the methods through which EM is achieved, the incentives and pressure that lead to this practice and the costs of EM. Finally it will evaluate and discuss the methods used in prior research to identify EM and the possible ways of identifying suspected EM firms, against which these methods can be tested.

2.2 Prior Research

Healy and Wahlen (1999) define EM as the practice whereby *''managers use judgment in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company, or to influence contractual outcomes that depend on reported accounting numbers*.'' EM is thus similar to fraud which Simmons (1995) defines as intentional untrue representations of important information on which victims of fraud rely. Both fraud and EM thus involve management intentionally providing false representation which impairs the usefulness of the reported financial information and thus the user's ability to make investment decisions (Clikeman, 2003). EM however differs from fraud, which is performed through the contravention of the financial reporting standards, in that it is performed within the flexibility provided by financial reporting standards.

Financial reporting is increasingly requiring management judgement and predictive information as this type of information is considered to be useful for decision making. This type of information however, provides management with additional opportunity to manipulate earnings through flexibilities provided in the accounting standards (Goel, 2012; Parfet, 2000). Finally, as EM appears to be the mere application of financial reporting standards, most users are unaware of its occurrence. Research however provides evidence of widespread EM (Clikeman, 2003).

Research performed by Burgstahler and Dichev (1997) noted a discontinuity around zero in the cross-sectional distribution of earnings. This suggests that firms manage earnings upwards to avoid making a loss. In addition, Degeorge, Patel and Zeckhauser (1999) showed that entities earnings meet or beat analysts' expectation more often than these expectations are missed and Mc Anally et al. (2006) discussed research

which showed a mere 3% of firms in the study reported slightly negative earnings. These phenomenon are unlikely in the absence of EM and can therefore be interpreted as evidence of EM (Collingwood, 2001; Degeorge et al., 1999; Healy & Wahlen, 1999; Mc Anally et al., 2006). Prior research thus supports the existence of EM and it is therefore necessary to understand EM and specifically, the methods through which it is achieved.

Accounting earnings are made up of accruals and cash flows, both of which can be used to manipulate earnings (Bayley & Taylor, 2007; Beneish, 1997). The most common form of EM is accruals manipulation whereby management uses judgement, estimates or other accounting accrual items to manipulate earnings (Phillips et al., 2003). Accruals comprise non-discretionary and discretionary or abnormal accruals. The latter, discretionary accruals are defined as the accruals which arise from EM (Bayley & Taylor, 2007; Beneish, 1997).

The alternative, real EM is achieved through short-sighted, operational decisions or contract structuring (Clikeman, 2003; Dechow & Skinner, 2000). An example of real EM identified by Peasnel et al. (2004) is sales to un-creditworthy customers at year end, in order to increase sales, which then in turn increases short term earnings but may then prove costly to the entity in the long run. Accruals based EM is however considered to be the preferred method of EM and is thus the focus of this research (Jansen et al., 2012). Real EM is not included in the scope of this research. Prior research suggests the existence of EM and thus it is necessary to understand what gives rise to EM and the effect that it has on stakeholders.

2.2.1 Causes and Effects of EM

EM may be income increasing or decreasing, depending on managements' incentives for manipulating earnings. In order to affect EM, management reduces expenses based on judgement, in order to increase earnings, so as to meet analysts' expectations (Burgstahler & Dichev, 1997; Graham et al., 2005; Healy & Wahlen, 1999). Alternatively managers defer earnings through increasing expenses based on judgements, in order to create reserves, which can be reversed out in future periods when additional profits will be required (Clikeman, 2003; Healy & Wahlen, 1999). Managers are thus often accused of focussing more on managing stakeholder expectations than on managing the business (Dechow et al., 2011)). Graham et al.

(2005) reported that incentives and pressures as discussed below, direct managements actions.

The first pressure experienced by management is to prevent losses in stock value. These losses arise from missed analysts' targets, unpredictability in earnings or unrealistic earnings expectations not being met. Google and Cisco share prices immediately lost 7% and 14%, respectively as a result of the firms just slightly missing expected results (Collingwood, 2001; Goel, 2012; Mc Anally et al., 2006). This effect of missed targets stems from analysts' views that a missed target evidences underlying problems and a lack of company control (Dechow & Skinner, 2000; Graham et al., 2005; Healy & Wahlen, 1999). In addition, unpredictability is a sign of risk to users and thus requires a risk premium, increasing the cost of capital (Graham et al., 2005; Peasnell et al., 2004). Finally, current year earnings provide information used in estimation of future year earnings and thus as was seen in the case of the company known as SR One, where a non-recurring item, despite being disclosed as such, resulted in a significant current period increase in share price and a subsequent large decrease in share price in the consecutive period (Collingwood, 2001).

Secondly management is often incentivised to manage earnings for personal gain, whether financially, or in order to protect their reputation. Management's compensation is often linked to earnings. This can be through earnings based bonuses or share option schemes, for which the value is closely linked to earnings, through the share price as discussed above. Healy's (1985) research supports this statement as it found that 90% of the 1000 largest US manufacturing corporation's management remuneration policies were based on accounting earnings. Healy (1985) also stated that management's accrual policy is mostly linked to their income reporting incentives. Thus, it would seem that in an attempt to align managements interest with those of the shareholders, they have in fact provided management with an incentive for EM (Clikeman, 2003; Dechow & Skinner, 2000) (Watts and Zimmerman, 1978 in Healy et al, 1999).

Thirdly, management's job security and future career development is often linked to the firm's performance. Graham et al. (2005) found earnings to be the most important measure of manager's performance (Schlosser, Sung, Boyle, & Neering, 2001;

Watkins, 2003). Management is thus incentivised to manipulate earnings, increasing the risk of the costly practice of EM and thus the need to detect it. The structure of management's compensation and the pressures around performance can therefore provide an incentive for upwards EM.

Finally, there are other, less prevalent and yet real incentives for EM. DeFond and Jiambalvo (1994) demonstrated in their study that protecting a firm's credit reputation and the prevention of debt covenant violations is an incentive for EM. Their study demonstrated this as it showed that most firms accelerated earnings in the year preceding a loan violation, in an attempt to prevent violating debt covenants and the costs and reputational damage that result (Clikeman, 2003; Graham et al., 2005; Healy & Wahlen, 1999) In addition, regulatory authorities, whether directly or indirectly, influence EM. Managers perform EM in order to manipulate the impact of legislation for example, companies under investigation for antitrust violations often deflate earnings to avoid sanctions (Clikeman, 2003; Healy et al, 1999). Managers thus experience significant pressures and incentives to perform EM. It is therefore necessary to evaluate the effect of EM on firms. While earnings may increase as a result of EM in the short-term, these are not long term, sustainable increases in earnings and there are potentially significant long term costs associated with the practice.

The main cost of EM is experienced through the damage it does to the faithful representation of financial statements. As a result of manipulation, the financial statement's ability to predict and provide insight into the firm's real financial position is impaired (Clikeman, 2003; Collingwood, 2001; Dechow & Skinner, 2000; Goel, 2012; Healy, 1985; Healy & Wahlen, 1999; International Accounting Standards Board, 2012b). As a result, shareholders decision making ability is also impaired, which often results in costly misinformed investment decisions (Collingwood, 2001; Graham et al., 2005; International Accounting Standards Board, 2012a).

Analysts' are also exposed to costs through misrepresentation since through EM, the financial statements on which they base their analysis and then provide recommendations, are no longer accurate, threatening the accuracy of their recommendations and as a consequence, possibly damaging their reputation. In addition, EM increases the risk that an incorrect audit opinion is expressed, which

could result in both legal and reputational costs to auditors Dechow et al., 2011). As a consequence of EM users place less reliance on financial statements and must then seek other sources of decision-useful information (Collingwood, 2001; Graham et al., 2005; International Accounting Standards Board, 2012a). This can prove a costly activity. Finally, EM represents a breakdown in business ethics, which could eventually lead to more costly practices such as fraud (Merchant & Rockness, 1994). Due to the potential costs of EM, efforts need to be made to identify and then prevent EM.

2.2.2 Identifying suspected EM firms

Prior research has attempted to develop EM identification methods which would enable users to identify this costly practice. In order to test these diagnostics, it is necessary to compare them between suspected EM1 and EM0 It is therefore necessary to be able to identify firms from each category to then be used in the analysis of the effectiveness of these models. Literature suggests two broad ways in which firms suspected of EM can be identified. The first method is identification through a priori reason to suspect EM (Donelson, Mcinnis, & Mergenthaler, 2013; Richardson, Tuna, & Wu, 2002). The second method is identification through discontinuities in earnings distributions.

2.2.2.1 Identification based a priori reason for suspecting EM

The first identification method described is the identification of suspected EM firms through a priori reason for suspecting EM based on the evaluation of prior financial information reported by the firm. Various prior research such as that conducted by Jansen et al. (2012) used this approach. Jansen et al. (2012) identified EM firms based on five EM outcomes. These include firms which meet or beat analysts' expectations, report extreme earnings surprises, subsequently restate earnings upwards, experience a reversal in year-ahead profitability or produce predictable year-ahead abnormal returns (Jansen et al. 2012).

While the historical nature of the identification method, may provide a level of confidence in the firms identified as EM1 firms, it is subject to criticism. This identification method is criticised for its selection bias since the sample of EM firms most often only includes those firms responsible of significant EM as opposed to all levels of EM (Dechow, Ge, Larson, & Sloan, 2011). As a result, research tested

against these firms may not be applicable to entities which have undertaken less aggressive levels of EM (Dechow et al., 2011). In addition, the information required for this model is not always available, as is the case in South Africa, where information such as analysts' expectations, among other information which might suggest a priori reason, is not readily accessible.

2.2.2.2 Identification based on discontinuities in the distribution of earnings

The second identification method described is the identification of suspected EM firms through the identification of discontinuities in earnings distributions. This method is founded upon the prospect theory which suggests that users base decisions on the heuristic cut off of earnings thresholds being met or exceeded. In addition, it is founded on the premise that managers most commonly managed earnings so as to avoid losses, report profit growth or to meet analysts' expectations as suggested by Degeorge et al. (1999). This is partly due to the significant losses in share value that can result when any of these requirements are not met (Burgstahler & Dichev, 1997; Collingwood, 2001; Goel, 2012; Mc Anally et al., 2006). Of the three, the prevention of losses was found to be the most common Lahr (2014). Prior research performed by Hayn (1995) and Burgstahler and Dichev (1997), among others, therefore suggested that EM firms can be identified based on the assumption that managers will manipulate earnings to beat thresholds.

Burgstahler and Dichev (1997) conducted research to determine whether firms suspected of EM can be identified through discontinuities in the earnings distribution. They assumed that in the absence of EM, the earnings distribution would be relatively smooth. Smoothness was defined as the number of observations in any bandwidth of the distribution equaling the average of the two immediately adjacent bandwidths. This number of observations was used to develop their expectation which was then compared to the actual number of observations. This difference, divided by the estimated standard deviation of the difference was used as a test statistic to evaluate the smoothness of the distribution. The distribution was however not found to be smooth or normal, but instead presented a discontinuity at zero, with an unusually low number of small loss making firms and an unusually high number of small profit making firms. It was thus concluded that loss making firms and those with negative growth in earnings perform EM to prevent reporting losses or missing targets. Prior research thus suggests that the discontinuity of earnings around zero could suggest

EM (Burgstahler & Dichev, 1997; Collingwood, 2001; Goel, 2012; Mc Anally et al., 2006).

Earnings distributions can thus be used to identify EM through a comparison of the expected number of observations to the actual number of observations. If the difference between the actual number of observations and expected number of observations is significant, this is considered a discontinuity and interpreted as an indication of EM. The discontinuities identified will however depend on the assumptions underlying the expected number of observations which make up the reference distribution. The most difficult part of using the discontinuity of earnings to identify suspected EM firms is to determine this reference distribution, which is developed under the null hypothesis of no EM. Bollen and Pool (2009) identified weaknesses in the histogram method used by Burgstahler and Dichev (1997) and thus suggested a more robust, non-parametric method, known as kernel density estimation (KDE) (Bollen and Pool, 2009). This method is however dependent on two variables, the kernel chosen and the kernel bandwidth (Lahr, 2014).

The first variable affecting the distribution is the kernel chosen. Bollen and Pool (2009) used a Gaussian kernel which accounts for all sample observations and thus is potentially affected by outliers. Lahr (2014) tested three kernels namely, a Gaussian, Epanechnikov and uniform kernel. He concluded that the Epanechnikov which excludes outliers, is the preferable kernel to be used.

The other variable which affects the distribution is the bandwidth. An incorrect bandwidth can hide discontinuities or produce spurious inferences. It is thus important to use an optimal bandwidth in developing your reference distribution. Bollen and Pool (2009) used Silverman's (1986) rule of thumb to determine the optimal bandwidth (referred to as binwidths in their research). This method is not however applicable to all types of data. Lahr (2014) thus proposes the use of bootstrapping in order to determine the optimal bandwidth. This method thus ensures that the important step of determining a bandwidth is no longer an arbitrary process.

The following process is thus performed by Lahr (2014) in order to determine the optimal bandwidth. Firstly, a simple Kolmogorov-Smirnov test is broadly used to detect difference between the empirical cumulative distribution function (ECDF) and the integrated KDE. Secondly, confidence bands for KDE that agreed to the

empirical distribution are developed through a process of bootstrapping from the original sample. Bootstrapping is performed as follows; a-priori bandwidth, kernel function and confidence level are chosen. This kernel bandwidth is then iteratively adjusted in order to produce a suitable reference distribution which is not distinguished globally from the empirical data. Finally, Lahr (2014) identified the location of discontinuity based on a statistical test of significance (using a simple z-test or t-test) at the point of maximum difference between the ECDF and the IKDE.

The final requirement of identifying suspected EM firms through discontinuities in earnings is to deflate the earnings by a chosen variable. The earnings distribution includes a broad range of firm sizes. These firm's earnings thus need to be scaled in such a way as to make their earnings comparable. Prior research has used a variety of scaling methods such as market value, book value, sales and total assets. Burgstahler and Dichev (1997) chose to scale earnings by market value but also calculated the primary results scaled by the other variables which obtained quantitatively similar results. This aspect of the identification model has been criticised by Durtshi and Easton (2005) who noted that the deflation method used will have an effect on the distribution if the deflator itself differs between profit and loss making firms.

They evaluated various deflation methods used in prior research and found that most of the deflators did differ between profit and loss making firms (Durtshi and Easton, 2005). Durtschi and Easton (2005) however found that shares in issue at year end, does not systematically differ between profit and loss making firms. This variable is therefore considered to be a reliable deflator. Thus, especially in South Africa, where identification of suspected EM firms through a priori reason is not possible, identification through discontinuities in earnings distribution, calculated using Lahr's (2014) method and scaled by the number of shares in issue at the year end, could be considered a reasonably reliable alternate method of identification.

2.2.3 EM diagnostics

As EM is considered a costly practice, users of financial information require an EM diagnostic, enabling them to, with reasonable reliability, identify firms that may have undertaken EM in reporting their financial performance. Recent studies have attempted to identify EM through various methods, the most common being

discretionary accruals models and financial ratio and variable analysis. These two models will be assessed in the following sections.

Discretionary Accruals Model

Accruals are a normal part of the financial accounting process which ensures that transactions are reported in the period during which they occur. The judgement often required in this process however provides an opportunity for managers to manipulate earnings through accruals. De Angelo (1986) thus suggested that the analysis of total accruals could be used as a diagnostic for EM. Accruals are however made up of two types. These are discretionary accruals which are defined as accruals arising from earnings management and non-discretionary accruals which are considered to arise in the normal operations of the business. Thus discretionary accruals are the tool through which managers manipulate earnings.

Discretionary accruals are however not directly observable and research has thus suggested various ways to estimate this variable. Jones (1991) attempted to split total accruals into discretionary and non-discretionary accruals in order to develop a better EM detection model known as the Jones model. Dechow et al. (1995) further improved this model in developing the MJ Model (MJ Model) which is used in this research.

The Jones Model

The Jones model attempts to control for the effect that changes in a firm's economic circumstances have on its normal accruals. It suggests that if non-discretionary accruals can be estimated, the difference between total accruals and non-discretionary accruals can be assumed to be discretionary accruals. Change in sales and gross property plant and equipment are considered to be non-discretionary accruals in the Jones model and are used to control for changes in the firms operating activities and depreciation levels. The Jones model assumes that EM is not achieved through sales but rather views sales as an objective measure of the firm's performance before accrual manipulation (Dechow et al, 1995).

Jones (1991) regressed total accruals on proxies for the non-discretionary component of accruals based on data from immediately prior to what is known as the event period t. This regression is then used to determine t company specific parameters. The company parameters are then applied to the year t specific data in order to estimate

un-manipulated accruals and consequently, discretionary accruals which is the resulting error term (ξ_{it}) in the current period.

The Jones model in year t is calculates as follows, as discussed by Dechow et al. (1995).

$$TAcc_{it} = \alpha + \beta_1 (\Delta REV_{it}) + \beta_2 PPE_{it} + \xi_{it}$$

Where:

$TAcc_{it}$	Total accruals for firm i in period t. Total accruals are defined as firm i's income per the income statement in year t; minus firm i's cash flows from operations in year t;
ΔREV_{it}	change in firm i's revenue from period t-1 to t
PPE_{it}	gross property, plant and equipment for firm i in period t
β_1, β_2	Company specific parameters;
ξ_{it}	Error term or residual representing the discretionary portion of total accruals.

All variables are deflated by beginning-of-year total assets (Phillips et al., 2003)

The above formula can be adjusted in order to calculate discretionary accruals of the firm in the event period ($DAcc_{it}$) through the following regression:

$$DAcc_{it} = Total\ Acc_{it}\ \alpha - [\beta_1 (\Delta REV_{it}) + \beta_2 PPE_{it}\ ]$$

The Jones model's assumption that all movements in revenue are not discretionary is not always valid and renders this model unable to identify EM through sales. The Modified Jones Model (MJ model) was developed to overcome this limitation (Dechow et al., 1995).

The Modified Jones Model

The MJ Model is a variation of the Jones (1991) model which was developed to overcome the limitation of the Jones model and extend the original Jones model, enabling it to diagnose revenue based EM. The MJ Model assumes that all credit sales in the event period (during periods in which EM is hypothesised) are discretionary (Dechow et al., 1995).

The cross sectional modified Jones model as developed by Dechow et al. (1995) thus follows the same process as the Jones model but defines total accruals as follows:

$$Tacc_{it} = \alpha + \beta_1 (\Delta REV_{it} - \Delta REC_{it}) + \beta_2 PPE_{it} + \xi_{it} \quad (2)$$

Where:

ΔREC_{it}	= changes in firm i's receivables from year t-1 to t,

All other variables have been previously defined and All variables below are deflated by beginning-of-year total assets (Phillips et al., 2003).

Criticisms of discretionary accruals models

Discretionary accruals based models have been criticised by Mc Nichols (2000) and Fields, Lys, and Vincent (2001), due to the fact that these models are based on the behaviour of accruals without discretion (Fields, Lys, & Vincent, 2001; Mc Nichols, 2000). There is currently a lack of theory on the behaviour of accruals without discretion and so models based on this are at risk of inference problems and incorrect conclusions. In addition these models are often difficult and time consuming to apply, as discretionary earnings' components are not generally separately identifiable. To overcome these limitations Jansen et al (2012) suggests an alternative, simplistic EM diagnostic which will be applied in this study.

Variables as evidence of EM

In order to overcome the limitations of discretionary accrual models, Bayley and Taylor (2007) suggested the use of variable analysis models. Variables, which differ significantly between EM1 and EM0, are considered as potential EM indicators. Bayley and Taylor (2007) suggested analysing variables to detect earnings management. They supported this proposal with research which found significant financial statement characteristic differences between SEC overstated firms and control firms. This suggests that variable analysis can be a useful tool in EM identification. Prior research has suggested variables such as book-tax differences and sales and growth indexes (Bayley & Taylor, 2007; Institute for Digital Research and Education, 2013). Variable analysis thus provides an alternative to discretionary accruals, but it too is subject to limitations. The information for the variable analysis

is not always readily available and may also result in error (Dechow et al. (1995). Jansen et al (2012) thus suggests a new, simplistic diagnostic in order to identify EM.

The delta ATO and delta PM diagnostic

Jansen et al. (2012) suggest a simple financial ratio analysis diagnostic, based on the assumption, underlying the DuPont analysis. The DuPont analysis is founded upon the notion that a firm's sales drive both income and investment. Sales thus cause the net operating income on the Statement of Profit and Loss and Other Comprehensive Income and net operating assets on the Statement of Financial Position to vary directly in relation to a firm's sales.

An example of this occurs when a sale is made. As a result of the sale, both net operating assets (in the form of accounts receivables or cash) and operating profit, increase directly with sales. The ATO and PM ratio should therefore not differ before and after this transaction as both variables in each ratio vary directly with one another.

It is thus suggested that in the absence of EM, the ATO and PM ratios should not change over periods, assuming constant growth, as both inputs vary directly with one another. Jansen et al (2012) thus suggests that a change in the ATO or PM model could be indicators of EM and should thus be investigated.

An illustration of this is seen in instances where management manipulates the provision for doubtful debts balance through understating it or incorrectly reversing it, in order to increase earnings. This would have no effect on Sales but would increase operating profit through the provision for bad debts adjustment income, and have the effect of increasing net operating assets through the resulting increase in Accounts receivable. Thus, in the presence of EM, sales no longer vary directly with these other two variables, resulting in a change in the ATO and PM ratios. Jansen et al. (2012) is thus suggesting that a value for delta ATO or delta PM is an indicator of EM.

Jansen et al. (2012) also proposed that an indirect relationship between ATO and PM could further signal EM (Jansen et al., 2012). This is seen in the above illustration where, as a result of the increase in operating profit, the profit margin will increase whereas the increase in the accounts receivables will result in the ATO ratio decreasing. This results in an inverse relationship as a result of EM (Jansen et al., 2012).

Jansen et al (2012) suggest that this diagnostic is useful in detecting EM as they found that the delta ATO and delta PM diagnostic was significantly more accurate than Kothari, Leone & Wasley's (2005) performance adjusted abnormal accruals model in detecting firms that meet or beat analysts' expectations. The delta ATO and delta PM measure is supported by its underlying fundamental relationship in the accounting model. Unlike the estimated relationships upon which abnormal accruals models are typically based, this ratio is based on identifiable amounts in the financial statements (Jansen et al., 2012).

In summary, two aspects of the literature review are pertinent to this research, the first being the method used to identify suspected EM firms. From the literature, it is evident that the Burgstahler and Dichev (1997) method suffers from weaknesses. The three main weaknesses include its assumptions that the discontinuity is only at zero, that there is a linear relationship between bandwidths adjacent to zero and those at zero and finally the researcher selected bandwidths. KDE (as applied in the appendix A) is therefore considered a more appropriate method of identifying EM firms as it overcomes many of these problems through using an Epanechnikov kernel and applying bootstrapping to estimate binwidths from the data itself (Lahr, 2014). The second aspect is the method used to identify evidence of EM. The literature shows that current methods such as the Jones (1991) and Modified Jones model have proved difficult to estimate and are not entirely accurate (Dechow, Sloan and Sweeney, 1995). Jansen et al. (2012) has thus suggested an alternative tool based on the assumptions underlying the Du Pont analysis and as a result the relationship between delta ATO and delta PM which is easily observable from financial statements.

Chapter III – Methodology

This research has as its objective to determine whether delta ATO and delta PM have an inverse relationship and whether they are significantly larger for suspected EM firms when compared to non-EM firms. Thereafter, logistic regressions are used to explore whether there is an association between delta ATO, delta PM and a combination of these variables with EM. Finally this research aims to identify whether the delta ATO and delta PM diagnostic is incrementally useful to modified Jones discretionary accruals in identifying suspected EM firms. The relevant suspected EM firms used in the analysis were identified through kernel density estimation (KDE). The data used was secondary data obtained from research performed by Rabin & Negash (2012) based on the methodology suggested by (Lahr, 2014). This methodology is further discussed in Appendix A.

The remainder of this chapter is structured as follows:

The hypotheses are stated (section 3.1) followed by a discussion of the research paradigm applied in this research (section 2). Section 3 then discusses the methods used to collect the data required for identifying the firms suspected of EM, to calculate the ratios, the discretionary accruals and to perform the necessary statistical tests as well as the logistic regressions. Section 4 discusses the use of the secondary data that was obtained from Rabin and Negash (2012) research which was used to identify the relevant EM firms that were used in the sample analysed in this study. This method is explained in detail in the appendix A. The focus if this chapter is section 5 which provides an overview of the methodology used to evaluate and test the data that is analysed in this study. Finally, section 6 concludes the discussion with an evaluation of the validity and reliability of the method used.

3.1 Hypothesis and null hypothesis

Jansen et al. (2012) suggested that sales should vary directly with both net operating assets and operating profit and thus, in a stable growth environment, both the ATO and PM ratio should remain constant. Thus, in the absence of earnings manipulation, a nil value for both delta ATO and delta PM is expected. EM (excluding sales EM) however distorts this direct relationship resulting in movements in both ratios and

values for delta ATO and delta PM. It is thus expected that these ratios will be significantly different between EM0 and EM1 firms in the presence of EM.

In reality, other factors such as changes in profit margin or asset holding levels will also impact these variables and thus a nil value is unlikely Jansen (2012). Variables in EM 1 firms are however expected to be larger than those in EM0 firms. This is due to the delta ATO and delta PM ratios in EM1 firms being affected by both EM and the other general factors, whereas EM0 firms will only be impacted by the general factors. Because upward EM results in ATO decreasing, and PM increasing, an inverse relationship is expected for EM1 firms (Jansen et al., 2012). Therefore, overall it is expected that there is an association between these ratios and EM. Because ATO and PM inputs are easy to calculate from the financial statements, this simplistic diagnostic is expected to be incrementally useful to discretionary accruals in identifying suspected EM firms (Jansen, 2012).

The following hypotheses will be tested in this research:

Hypothesis 1: delta ATO and delta PM ratios have an inverse relationship and are significantly larger in suspected EM firms as compared to non- EM firms.

Hypothesis 2: The following associations are hypothesised;

a) There is an association between delta ATO and EM.
b) There is an association between delta PM and EM.
c) There is an association between delta ATO and delta PM and EM.

Hypothesis 3: Individually, and in combination, the delta ATO and delta PM are incrementally useful to Modified Jones discretionary accruals in identifying suspected EM firms.

3.2 Research paradigm

All research is guided by a comprehensive world view or framework known as a research paradigm (Willis, 2007). This research follows a scientific, positive approach which attempts to describe situations objectively and without human emotions (Coetsee, 2010; Inanga & Schneider, 2005). This form of research is thus conducted as follows:

Firstly, a problem is identified, observed and a hypothesis developed. Data is then collected for analysis and testing in order to prove or disprove this hypothesis. The methodology used in positivist research, to test the research hypothesis, is vital. Positive research most commonly relies on statistical tests (Ryan, Scapens, & Theobald, 2002). Due to the largely quantitative nature of EM, prior research into this phenomenon has mostly used a quantitative, positivist approach (Dechow et al., 1995; Lahr, 2014; Peasnell et al., 2004; Phillips et al., 2003; Rabin & Negash, 2012). This same approach is applied in the research conducted for this study.

3.3 Data collection, sample and EM0 and EM1 firm identification

3.3.1 Data collection and sample

The inputs required for the delta ATO and delta PM diagnostic, the discretionary accruals, as well as earnings and number of shares were extracted from INET BFA database. The data was obtained for all firm years of JSE listed firms, for the years ending 2000-2010. Following Burgstahler & Dichev (1997), financial institutions and mines were specifically excluded due to the unique regulatory environment in which they operate and differences in the accounting practices in these sectors (Burgstahler & Dichev, 1997; Peasnell et al., 2004). The data was then analysed through making use of excel and Stata. The number of firm year observations totalled 1 862 and the number of individual companies totalled 212. As not all firms report the variables required in this research, the sample size in each part of this research varied slightly and is reported in the relevant table of results.

The earnings obtained from INET BFA were deflated by the number of shares at the end of the year in performing KDE as this is considered to be a neutral deflator (Durtschi & Easton, 2005). The deflated variables are continuous in nature. In calculating the delta ATO diagnostic, observations in which net operating assets were negative in year t-1 or year t were excluded from the sample. These variables were excluded as negative net operating asset values resulted in an undefined ATO (Jansen et al., 2012). All independent variables were then winsorised at the 1% and 99% level to remove the effects of outliers on the results. Finally, all logistic regressions performed were subjected to the necessary diagnostic tests (Institute for Digital Research and Education, 2013).

3.3.2 Identifying suspected EM firms using KDE

The relevant EM firms were identified through KDE. The data used was secondary data which was obtained from research performed by Rabin & Negash (2012). Rabin and Negash (2012) identified the firms suspected of EM through a comparison of the empirical distribution of earnings after tax, deflated by ordinary number of shares in issue at the financial year-end, to a reference distribution constructed using KDE, as proposed by Lahr (2014). EM firms were identified at the point of maximum difference between the reference and empirical distributions. The process used to develop the reference distribution through KDE and the results are discussed in detail in Appendix A.

Rabin & Negash (2012), found a statistically significant discontinuity around zero. The band, immediately above zero (0 to 0.2382892) was identified as the EM1 band as prior research suggests that managers manipulate earnings upwards to avoid making a loss (Burgstahler & Dichev, 1997). The EM1 band showed 496 observations, far above the 248 expected observations. The additional 248 observations were therefore suspected to have been the result of firms managing earnings in such a way as to fall into this band. The band below zero had fewer observations than expected, suggesting firms have managed earnings upwards to fall into the EM1 band. (Rabin and Negash, 2012). The band to the right of the EM1 band however also had 65 fewer observations than expected, suggesting that the EM1 band may be a mix of firms which have managed earnings to either increase and or decrease earnings. The firms identified by Rabin and Negash (2012) as being within the EM1 band were used as the sample of EM1 firms in the research conducted in this study.

3.3.3 Eliminating downwards EM firms

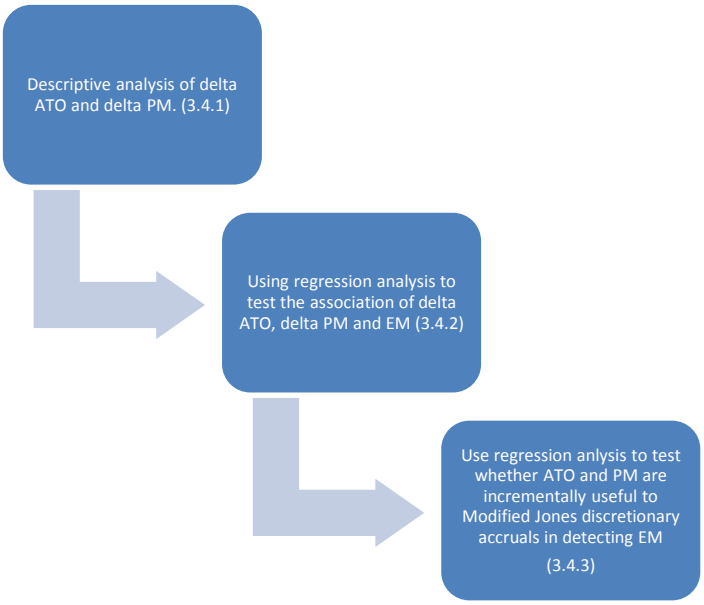
An analysis of earnings distribution indicated that the EM1 band may comprise a mix of firms which have manipulated earnings either upwards or downwards. Downwards EM has been excluded from the scope of this research. This research aims to assess the ability of Jansen et al.'s (2012) diagnostic in identifying upwards EM. This research thus eliminates those firms in the EM1 band suspected of managing earnings downwards. The method used to achieve this is the relationship suggested by Jansen et al. (2012). For example, when provision for doubtful debts is increased in order to

decrease earnings, the ATO and PM ratios are impacted as follows: Firstly, operating profit is expected to decrease, decreasing PM. Secondly, accounts receivable decreases, increasing the ATO ratio. Thus all firms in the EM1 band reflecting this characteristic, negative delta PM and positive delta ATO have been removed from the sample of EM1 firms that have been analysed in this study.

3.4 Analysing the Delta ATO Delta PM

This research aims to address the three stated hypotheses through an empirical analysis of delta ATO and delta PM ratios for the sample of JSE listed firms. Subsequent to identifying the EM0 and EM1 firms as discussed in Section 3.3, descriptive statistics and logistic regression was performed for the ATO and PM ratios as described in the diagram and sections that follow.

Figure 2: *Overview of Method*



3.4.1 Descriptive analysis of delta ATO and delta PM

The ATO and PM ratios were calculated for both EM0 and EM1 firms according to the following formulae adapted from Jansen et al.'s (2012) research:

ATO= Sales/Net operating Assets

PM= Operating profit /Sales

Net operating Assets= [(total assets-total liabilities)-(cash and near cash-long term interest bearing debt-short term interest bearing debt)].

Operating income was defined in this research as Profit before tax and finance charges.

The formulae used were the same as those used by Jansen et al.'s (2012) research except for the definition of operating income due to limitations in obtaining the individual variables. Jansen et al. (2012) defined operating income as sales less cost of goods sold less selling, general and administrative expenses less depreciation and amortisation expense.

The change in the PM ratio and the change in the ATO ratio for both EM0 and EM1 firms were calculated as follows:

Delta ATO_t = (sales $_t$ / net operating assets $_t$) - (sales $_{t-1}$ / net operating assets $_{t-1}$)

Delta PM_t = (Profit before tax and finance charges $_t$ / sales $_t$) - (Profit before tax and finance charges $_{t-1}$ / sales $_{t-1}$)

The following table represents the hypothesised movement in the variables individually and in relation to each other in EM1 firms, where earnings are increased through EM, and in EM0 firms, where a valid increase in earnings is present.

Table 1: hypothesised movements in delta ATO and delta PM

Variables	**EM1 firms**	**EM0 firms**
Delta ATO	Decrease	No or slight increase
Delta PM	Increase	No or slight increase
Variable movement in relation to each other	Inverse relationship	Direct relationship

All independent variables are winsorised at 1% and 99% to limit the impact of outliers on the results. Descriptive statistics are presented for each variable in the Results section. The means and medians of both variables were compared in the suspected EM0 and EM1 firms using the clustered t-test (test of the mean) and a Somers d test (a test of medians). Clustered data was used because data for a number of years for

the same firms is present in the sample and thus similarities present within the various years of reporting in each company need to be removed. A variable is considered to be significantly different between the two categories in this research if it is found to be significant at a 5% level.

3.4.2 Using regression analysis to test the association of delta ATO, delta PM and EM

The association between delta ATO and delta PM is tested using logistic regression. Logistic regression is a non-parametric regression used to model the relationships between a defined independent and dependent variable. Delta ATO and delta PM, are the independent variables, with firms identified as EM0 or EM1 being the dependent variable. Logistic regression determines an odds ratio; i.e. logit (p)=p/(1-p) where p is the probability of the dependent variable being an EM1 firm, or alternatively, the probability of it being an EM0 firm. Logistic regression is used in this research as it does not assume a normal distribution (Finney, 1952). The variables are clustered when performing this regression so as to account for the fact that data from a specific firm, over a number of years, is not independent.

To investigate the association of delta ATO and delta PM and EM, we estimate the following models using logistic regression:

$EM_1/EM_0 = \propto + \beta\,(deltaATO) + \beta \blacktriangle CFO_{it}$

$EM_1/EM_0 = \propto + \beta\,(deltaPM) + \beta \blacktriangle CFO_{it}$

$EM_1/EM_0 = \propto + \beta\,(deltaATO) + \beta\,(deltaPM) + \beta \blacktriangle CFO_{it}$

Where:

α	Is the intercept
EM_1/EM_0	EM_1= Where the firm has been identified as a suspect EM1 firm using KDE distribution. EM_0= Where the firm has been identified as a firm not suspected of EM, i.e. and EM0 firm using KDE distribution.

▲CFO_{it}	The change in firm i's cash flows from year t-1 to t, deflated by total assets at the end of year t-1.

The change in cash flows is included as a control variable to control the effects of a change in cash flows from continuing operations on a firm's status as an EM firm (Phillips et al., 2003). This control variable thus removes the effects of high performance ensuring that firms are not incorrectly identified as EM1 firms due to legitimate increases in earnings as a result of improved performance.

3.4.3 Use of regression analysis to test whether ATO and PM are incrementally useful to Modified Jones discretionary accruals in detecting EM

Logistic regressions are used to evaluate whether the delta ATO and delta PM diagnostic is incrementally useful to discretionary accruals in identifying EM, a series of combined logistic regressions were performed to achieve this.

3.4.3.1 Modified Jones Discretionary accruals

Discretionary accruals are calculated using the MJ Model, Dechow et al. (1995). ΔREC_{it} is subtracted to modify the Jones (1991) model so that credit sales are considered to be discretionary. As with the Jones (1991) model, total accruals are first estimated for all firms except those suspected of EM, in order to determine the estimated company parameters. As the assumption in the first equation is of no EM, ΔREC_{it} which is now considered to represent discretionary accruals, is excluded from the estimation.

The estimated parameters (β_1, β_2), determined from the first estimation are then applied to EM1 firms in order to determine the level of normal accruals in these firms. In the equation below, $\beta 1$ (Δ REV_{it} – Δ REC_{it}) and β_2 PPE_{it} estimated from all non-EM firm observations are proxies for non-discretionary accruals. The resulting error term, or difference between total accruals and normal accruals is considered to be an estimation of discretionary accruals.

Normal accruals

$$Tacc_{it} = \alpha + \beta_1 (\Delta REV_{it} - \Delta REC_{it}) + \beta_2 PPE_{it} + \xi_{it} \quad (1)$$

All variables have been defined in prior sections.

3.4.3.2 Determining whether an association between discretionary accruals and EM exists

Determining the association between discretionary accruals and EM was not a specific hypothesis of this research but was performed to determine the validity of the use of Discretionary accruals as an independent variable in the incremental analysis. Thus, in order to determine whether an association existed between discretionary accruals calculated using the MJ model, scaled by total asset and EM, the following model was estimated using logistic regression:

$$EM1/EM0 = \propto + \frac{\beta(\text{Discretionary Accruals})}{\text{Beginning of the year Total Assets}} + \beta \blacktriangle CFO_{it}$$

3.4.3.3 Testing whether delta ATO and delta PM are incrementally useful to discretionary accruals calculated using the MJ Model

A logistic regression was performed in order to determine whether the delta ATO, delta PM diagnostic was incrementally useful to discretionary accruals estimated using the MJ Model, in identifying suspected EM firms. Logistic regression was used as it does not assume a normal probability distribution. The delta ATO, delta PM (Section 3.5.1) and discretionary accruals calculated using the MJ Model (section 3.5.3.1) are the independent variables. The firms as identified by Rabin and Negash (2012) as EM0 or EM1 firms through KDE (section 3.4) are the dependent variable. The variables in this test were clustered as discussed in section 3.5.2. The following logistic regressions of each variable with discretionary accruals and both models with discretionary accruals were performed.

$$EM_1/EM_0 = \propto + \beta deltaPM + \frac{\beta(\text{Discretionary Accruals})}{\text{Beginning of the year Total Assets}} + \beta \blacktriangle CFO_{it}$$

$$EM_1/EM_0 = \propto + \beta deltaATO + \frac{\beta(\text{Discretionary Accruals})}{\text{Beginning of the year Total Assets}} + \beta \blacktriangle CFO_{it}$$

$$EM_1/EM_0 = \propto + \beta deltaATO + \beta deltaPM + \frac{\beta(\text{Discretionary Accruals})}{\text{Beginning of the year Total Assets}} + \beta \blacktriangle CFO_{it}$$

3.5 Validity and reliability

This research is based on the relationship between delta ATO, delta PM and EM as proposed by Jansen et al (2012). Jansen et al. (2012) found the relative explanatory power of the delta ATO, delta PM diagnostic (which he referred to as ATO/PM) to be significantly higher than Kothari, Leone & Wasley's (2005) performance adjusted abnormal accruals model (Jansen, 2012). He proposed that this explanatory power arose from the underlying fundamental relationships in the accounting model on which the delta ATO, delta PM diagnostic is based. The model used in this research thus has construct validity. In addition, all the relevant assumptions underlying the logistic regression have been tested and the independent variables, ATO, PM and discretionary accruals were chosen based on prior research suggesting their association with EM. Further, the variables were tested for their association with EM through logistic regression. All logistic regressions performed were tested for correlation between the variables. There are no strong correlations ($r>0.75$) between any of the independent variables or between the independent variables and dependent variables. In order to limit Heteroscedasticity extreme observations, the top and bottom 1% of observations were winsorized (Institute for Digital Research and Education, 2013). A R^2, goodness of fit test, was performed, on all logistic regressions, for the variables tested in this research and found to be in the region of 5% to 25%. This is considered reasonable as this research does not involve multiple independent variables and delta ATO and delta PM were not found to be highly correlated. This suggests no multi-collinearity among the variables in this research. The research is thus considered to be valid (refer to ***Table 3, 4, 5*** *and* ***6***). The independent variables used in this research were extracted directly from firm's financial reports which result in the information used in this research being considered reliable. The highest protocol was followed when constructing all statistical tests and thus the methods and results are considered reliable.

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Chapter IV – Results

4.1 Introduction

This section analyses the results of the research carried out according to the methodology described in chapter III. It addresses the research hypotheses to determine whether delta ATO and delta PM have an inverse relationship and are significantly larger for suspected EM firms when compared to non-EM firms. It also determines whether there is an association between delta ATO, delta PM and EM and finally determines whether the delta ATO and delta PM diagnostic is incrementally useful to modified Jones discretionary accruals in identifying suspected EM firms.

4.2 Primitive analysis of the results

A general analysis of the delta ATO and delta PM variables using excel suggested that Jansen et al.'s (2012) assumptions regarding the characteristics of these variables in the presence of EM is reasonable. For the majority of EM1 firms (63%) delta ATO was negative whereas the majority of EM0 firms (58%) showed a positive delta ATO. The delta PM further supported Jansen et al.'s (2012) with a positive delta PM in 70% of EM1 firms and a negative value in 73% of EM0 firms. This primitive analysis suggests that the characteristics of these variables in the presence of EM are in line with those suggested by Jansen et al. (2012). Despite the variables generally moving in opposite directions for all firms, only 34% of the EM1 firms demonstrated this relationship on an individual basis. This therefore indicates that these variables may need to be analysed individually. The statistical tests performed on this data will be discussed in the following sections in order to further analyse the results and address the three Hypotheses.

4.3 Descriptive Statistics

In order to determine whether a significant difference existed in the delta ATO and delta PM ratios, descriptive statistics were calculated. These include the mean, median, clustered t-test and Somers D test and are reported in ***Table 2:*** *Descriptive Statistics*. Due to the abnormal nature of the data's distribution, which potentially distorts the results of the mean, the median is considered to provide more useful information. The clustered t test and Somers d test produces a probability figure (p-value) describing the probability that the difference in variable between EM0 and EM1 firms, is due to chance and thus whether there is a significant difference between EM0 and EM1 firms.

4.3.1 Assessing the direction of the movement in delta ATO and delta PM, their relationship and their relative magnitude between EM0 and EM1 firms.

The research aimed to determine whether delta ATO and delta PM have an inverse relationship in the presence of EM and if they are significantly larger in suspected EM firms as compared to non- EM firms. As per ***Table 1: hypothesised movements in delta ATO and delta PM*** in chapter III, it was expected that in EM1 firms, delta ATO would be negative and delta PM, positive. Descriptive statistics, a clustered t test and Somers d test were performed. Delta ATO's mean (-.3594722) and median (-.0652564) were both found to be negative for EM1 firms. In addition Delta PM's mean (.076437) and median (.0150691) were found to be positive in EM1 firms. This supports Jansen et al.'s (2012) proposition that an inverse relationship in delta ATO and delta PM can be used to indicate EM.

In addition, the clustered t-test and Somers d test found delta ATO to be significantly different between EM0 and EM1 firms (p= 0.06 and p=0.00 respectively). The delta PM was also found to be significant, with both the clustered t-test and Somers d test reporting a p-value of 0.00. The EM0 firms however did not display the direct relationship expected, with both ratios means and medians presenting opposite signs.

Finally, the research found the mean for both delta ATO (EM0=.3086364; EM1= -.3594722) and delta PM (EM0=-.0635929; EM1= .076437) to be larger in EM1 firms than EM0 firms. This was however not the case for the median where in both the delta ATO (EM0=.0733015 ; EM1= -.0652564) and delta PM (EM0=-.0615432; EM1= .0150691) ratios, EM0 firms had higher medians. As the median is considered more reliable, the results are inconclusive and the ratios cannot be assumed to be higher in EM1 firms as opposed to EM0 firms.

This research thus suggests that delta ATO decreases and delta PM increases in EM1 firms. Therefore, an inverse relationship between delta ATO and delta PM is present in EM1 firms as suggested by Jansen et al (2012). These variables are significantly different between EM0 and EM1 firms. EM1 firms however cannot be concluded to have significantly larger values.

Table 2: *Descriptive Statistics*

Variable		Obs	Mean	median	Standard deviation	Clustered t-test		Somers d test	
						p-value	Coeff	p-value	Coeff
Delta ATO	EM 0	214	.3086364	.0733015	1.862679	0.006	-.6681086	0.000	-.2552782
	EM 1	336	-.3594722	-.0652564	2.66398				
Delta PM	EM 0	182	-.0635929	-.0615432	.3469678	0.000	.1400298	0.000	.5466808
	EM 1	326	.076437	.0150691	.2184483				
Delta CFO	EM 0	208	.0080258	.007272	.1641293	0.000	.043497	0.000	.1798876
	EM 1	433	.0515228	.0315452	.1613404				
Discretionary Accruals	EM 0	201	-.0677208	-.0390171	.1660715	0.000	.0963055	0.000	.3827823
	EM 1	417	.0285847	.030218	.112474				

4.4. Determining whether an association exists between delta ATO, delta PM individually and EM

A logistic regression was performed for both the delta ATO and delta PM ratios to determine whether there is an association between delta ATO, delta PM individually and EM. The results are reported in ***Table 5*** below. The logistic regression for delta ATO reported a negative coefficient (-0.1722633) which suggests that the probability

of a firm being an EM1 firm increases as the delta ATO becomes more negative. This coefficient was however not found to be significant, only proving significant at a 10% level (p-value=0.071). This indicates that there is a weak association between delta ATO and EM.

The logistic regression for delta PM reported a positive coefficient of 2.848867. This suggests that as delta PM becomes more positive, the likelihood of the firm being an EM1 firm increases. This coefficient is considered significant at a 5% level with a p-value=0.043. There is thus an association between the delta PM variable and EM.

4.5 Determining whether an association exists between Delta ATO and Delta PM combined and EM

Finally, a combined logistic regression with each variable separately included was performed in order to determine whether an association exists between a combination of delta ATO and delta PM, and EM. This logistic regression again demonstrated through its inverse coefficients, that a firm with a more negative delta ATO (-.1533266) and positive delta PM (2.669435) is more likely to be an EM1 firm. It is thus noted that individually and combined, the inverse relationship is suggested. In combination however, both variables significance levels deteriorated with delta PM becoming significant at the 10% level as opposed to the 5% level. Delta ATO is no longer considered significant at even a 10% level (p-value=0.167). This therefore suggests that it is rather the direction of the individual movements of the firms, as opposed to a combined inverse relationship, which indicates EM.

Table 3: *Correlation between the variables in EM1 firms*

EM1	**Combined delta ATO, delta PM**	**Delta CF**	**Delta ATO**	**Delta PM**	**Discretionary accruals**
Combined delta ATO, delta PM	1	-0.0532			-0.0283
Delta CF	-0.0532	1	0.0539	0.0982	-0.5025
Delta ATO		0.0539	1	0.0105	-0.1179
Delta PM		0.0982	0.0105	1	0.0502
Discretionary Accruals	-0.0283	-0.5025	-0.1179	0.0502	1

Table 4: *Correlation between the variables in EM0 firms*

EM0	Combined delta ATO, delta PM	Delta CF	Delta ATO	Delta PM	Discretionary accruals
Combined delta ATO, delta PM	1	0.0346			-0.0284
Delta CF	0.0346	1	0.0126	0.2050	-0.4049
Delta ATO		0.0126	1	-0.1539	-0.2323
Delta PM		0.2050	-0.1539	1	0.2740
Discretionary Accruals	-0.0284	-0.4049	-0.2323	0.2740	1

Table 5: *Results of the logistic regression of Delta ATO, Delta PM and the combined model*

Results	Delta ATO	Delta PM	Combined	
			Delta ATO	Delta PM
Coefficient	-.1722633	2.848867	-.1533266	2.669435
Standard error	.095382	1.405645	.110914	1.415222
Z	-1.81	2.03	-1.38	1.89
P>|z|	0.071	0.043	0.167	0.059
observations	527	491	477	477
R^2	0.0438	0.0805	0.0984	

4.6. Determining whether delta ATO and delta PM are incrementally useful to discretionary accruals in identifying EM.

4.6.1 Logistic Regression of Discretionary Accruals

Before testing whether ATO and PM are incrementally useful to modified Jones discretionary accruals, in detecting earnings management, this research tests whether discretionary accruals in its own right is useful in detecting earnings management.

The mean, median and significance levels of both are presented in ***Table 2:*** *Descriptive Statistics.* Both the mean (EM0= -.0677208; EM1= .0285847) and median (EM0=-.0390171; EM1=.030218) were higher in EM1 firms as opposed to EM0 firms, suggesting that, as expected, discretionary accruals are higher in EM1 firms than EM0 firms. In addition, both the clustered t-test and Somers d test

indicated that this variable is significantly different between EM0 and EM1 firms with a p-value of 0.00 in both. In addition, the logistic regression reported a significant (p-value= 0.00), positive coefficient of 9.882074. This suggests that the more positive the discretionary accruals are, the greater the probability of the firm being an EM1 firm. Thus, EM can potentially be identified through a higher level of discretionary accruals when compared to non-EM firms.

4.6.2 Logistic regressions of Delta ATO, Delta PM and discretionary accruals

In order to determine whether delta ATO and delta PM are incrementally useful to discretionary accruals in identifying EM, the following combined logistic regressions were performed. The results are reported in ***Table 6*** below. Two combined logistic regressions of discretionary accruals and each variable was performed to determine whether each individual variable was incrementally useful to discretionary accruals in identifying earnings management. Finally a logistic regression of discretionary accruals and both variables was performed. Each instance is assessed below:

The logistic regression of delta ATO and discretionary accruals reported a negative, but not significant (p-value=0.42) coefficient (-.0795395) for delta ATO. Discretionary accruals report a higher (10.44632) and more significant coefficient (p-value=0.000). Delta ATO is thus seen not to be incrementally useful to discretionary accruals in identifying EM.

The logistic regression or delta PM and discretionary accruals reported an insignificantly (p-value =0.295) positive coefficient (1.40871). Discretionary accruals was again found to have a higher significant (p-value=0.00) coefficient (10.29091) Delta PM is thus also not seen to be incrementally useful to discretionary accruals in identifying EM.

Finally, a logistic regression of the complete Jansen et al. (2012) diagnostic was performed to determine if it is incrementally useful to discretionary accruals in identifying EM. This logistic regression reported only the discretionary accruals variable to be significant (p-value=0.00) with the highest coefficient (10.60972). Thus discretionary accruals appears to be a more useful EM diagnostic and delta ATO and delta PM do not appear to be incrementally useful to discretionary accruals in identifying EM.

Table 6: *Results of the logistic regression on Discretionary accruals and combinations of discretionary accruals, Delta ATO and Delta PM.*

Results	**Coefficient (Beta)**	**Standard error**	**Z**	**P>|z|**	**Observations**	**R^2**
Discretionary accruals	9.882074	1.409081	7.01	0.000	604	0.1902
Discretionary accruals and Delta ATO						
Delta ATO	-.0795395	.0986054	-0.81	0.420	496	0.2093
Abnormal Accruals	10.44632	1.498829	6.97	0.000	496	
Discretionary accruals and Delta PM						
Delta PM	1.40871	1.344791	-0.81	0.295	466	0.2223
Abnormal Accruals	10.29091	1.550293	6.64	0.000	466	
Discretionary accruals and Delta PM and Delta ATO						
Delta ATO	-.0900156	.1101524	-0.82	0.414	453	0.2336
Delta PM	1.305196	1.295506	1.01	0.314	453	
Abnormal Accruals	10.60972	1.569494	6.76	0.000	453	

4.7 Summary of results

The results of the descriptive statistics confirm that delta ATO and delta PM have an inverse relationship but are not significantly larger in suspected EM firms as compared to non-EM firms. The clustered t-test and Somers d test found that delta ATO and delta PM are significantly different between EM0 and EM1 firms. The means and medians however did not provide conclusive information on whether the ratios are greater in EM1 firms than in EM0 firms. Finally, the analysis showed that an inverse delta ATO and delta PM ratio is present in EM1 firms. The results thus

suggest that the direction of and potentially, the relationship between these two variables in a firm can be used to signal potential EM in the firm, that can then be further investigated. The logistic regressions of delta ATO and delta PM provided evidence of an association between delta ATO and delta PM and EM, albeit at a 10% and 5% level. This result, and the descriptive analysis, provides evidence that delta ATO and delta PM are useful ratios for auditors, investors and analysts to consider when evaluating the quality of financial statements.

Chapter V - Conclusions

7.1 Discussion

In this study, Jansen et al.'s (2012) delta ATO and delta PM diagnostic was found to demonstrate significance as an EM indicator, when considering each variable separately. It was however, not found to be incrementally useful to discretionary accruals estimated using the MJ Model in identifying suspected EM firms, and identified using KDE. In addition, the descriptive statistics on EM0 firms did not report the expected, direct relationship. I think that this is due to the following two factors:

Firstly, it is suggested that the assumptions required in this diagnostic, such as constant sales growth, may not always prove true and this may distort the results. In addition, this diagnostic is limited in its ability to identify EM through sales. The modified Jones model however includes identification of sales based EM. The existence of sales based EM, which is measured in the MJ discretionary accruals, could thus partially explain the higher significance level of discretionary accruals, as opposed to the delta ATO and delta PM diagnostic.

Secondly, the diagnostic was tested against EM1 and EM0 firms identified through KDE. This distribution model identifies suspected EM firms based on discontinuities in the distribution. It is however possible that the sample of EM1 firms consists of a mixture of firms, those that have genuinely earned profits, those that have manipulated losses into profits and those that indulged in downwards earnings management. While an attempt was made to eliminate downwards EM firms, this method may not have accurately identified all downwards EM firms. The mixture of firms present in the EM1 band may potentially distort the results. Further research into the limitations discussed in this section is thus required.

7.2 Recommendations

This study aimed to evaluate the effectiveness of the diagnostic suggested by Jansen et al. (2012) in identifying and detecting EM. In addition it aimed to determine whether it is incrementally useful to the commonly used modified Jones discretionary accruals metric. This study was the first to apply Jansen et al.'s (2012) diagnostic within the South African business environment.

Despite the limitations of Jansen et al. (2012)'s delta ATO, delta PM diagnostic identified in this research, this diagnostic was still able to distinguish between EM0 and EM1 firms, albeit less successfully than discretionary accruals. The simplicity with which this diagnostic can be calculated, and the accessibility of the information it requires, result in it potentially being a valuable tool in identifying potential EM as a basis for further investigation. Significant results suggest that delta ATO and delta PM may be useful in identifying evidence of EM in a South African environment and potentially, other emerging markets.

There is thus a need for future research into this delta ATO and delta PM model in order to further test its ability to detect EM and to research ways in which sales EM can be included in this diagnostic. Finally, further research is needed into the KDE model in order to identify the firms within the EM1 band which are most likely to be the firms having undertaken EM. This model has significant potential, especially in emerging markets such as South Africa, where alternative sources of information on EM are limited.

Chapter VI –References

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Chapter VII –Appendices

Appendix A-Method used to identify suspected EM firms

The sample of suspected EM firms was secondary data obtained from research performed by Rabin and Negash (2012) based on the method developed by Lahr (2014). An empirical distribution of net income after tax deflated by the number of ordinary shares in issue at the year-end was developed and compared to the reference distribution. EM firms were identified at the point of maximum difference between the reference and empirical distributions. The reference distribution was constructed using an Epanechnikov kernel and applying Lahr's (2014) bootstrapping method. Lahr's (2014) bootstrapping method constructs a reference distribution in the absence of EM, from the underlying data itself.

The procedures used to identify the location of suspected EM firms (based on the work of H Lahr (2014) was as follows:

1. Silverman's (1986) rule of thumb was used to estimate a kernel bandwidth from the empirical data to act as a starting point for the iteration.
2. This estimated band width was then used to perform an Epanechnikov kernel density estimate (ECDF) from the empirical function.
3. The above ECDF was compared to the reference distribution in 1. To identify the maximum difference between the two distributions.
4. In order to construct a confidence interval for the empirical distribution at the point of maximum difference, bootstrap samples with replacement were drawn from the underlying data.
5. The kernel density at the point of maximum difference was then compared to the confidence interval. In instances where the kernel density at the point of maximum difference, was found to be located outside this confidence interval, the bandwidth was reduced. If the ECDF was found to be inside the confidence interval, the bandwidth was increased.
6. The process beginning from point 2. was then re-performed until a point where the ECDF meets the confidence band. It is at this point that Lahr (2014) suggests that the kernel is no longer distinguishable from the underlying global empirical distribution. An optimal bandwidth of 0.2382892 was identified in Rabin and Negash's (2012) research and used in this study.

7. In order to determine whether the point of maximum difference between the kernel and the empirical data is statistically significant, the expected number of observations within the intervals just above and below this point were tested against the actual number of observations using a z-test.

The results of Rabin and Negash (2012) research are presented in ***Table 1*** and ***Figure 1*** and discussed thereafter**.**

Figure 1: *A representation of the EM1 and EM0 firms' identification process through discontinuities in the distribution of earnings*

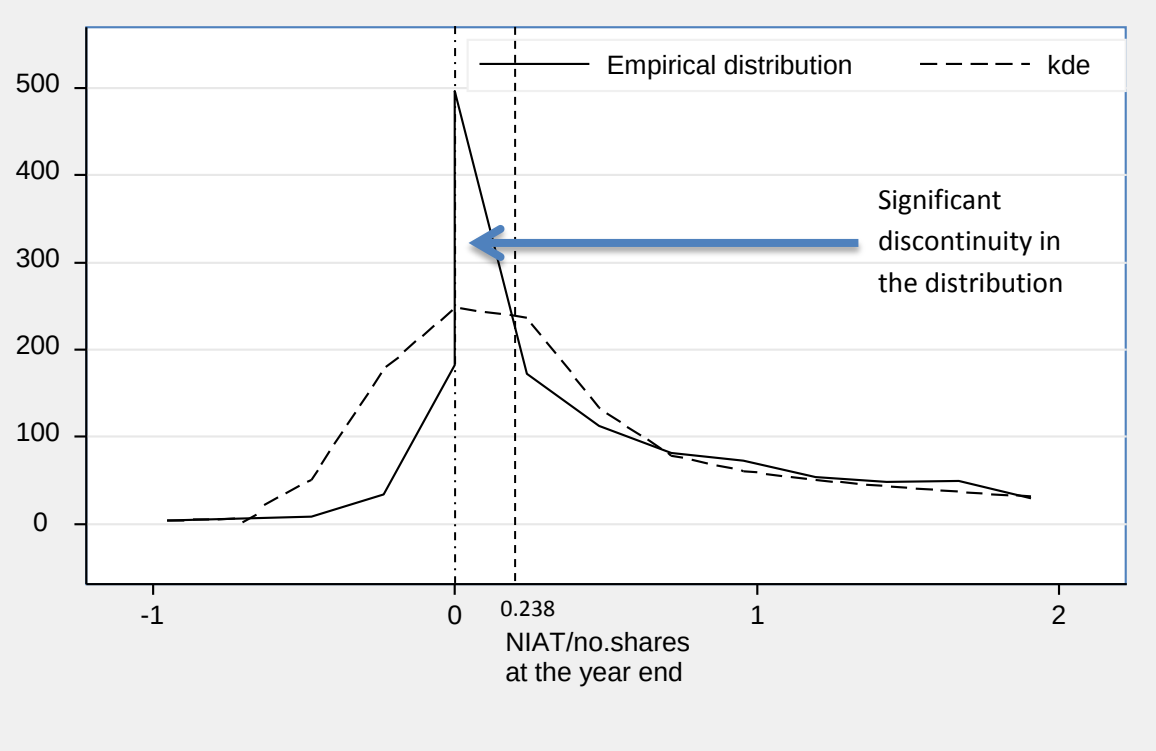


Table 1: *The KDE distribution of EM0 and EM1 firms*

Band	**Raw**	**KDE**	**Difference**	**EM**
-.7149177,-.4766285	9	50.66908	-41.66908	0
-.4766285,-.2383393	34	176.9192	-142.9192	0
-.2383393,-.0000501	182	247.797	-65.79703	0
0,-.2382892	496	247.8053	248.1947	1
.2382892,-.4765784	172	236.599	-64.599	0

The net income after tax, scaled by the number of shares at the year-end, ranged from -1.67 to 17.16. KDE revealed statistically significant discontinuity around zero in the three bands below zero and the two bands above zero. The remaining bands did not display significance and were excluded from the results. Prior research suggests that firms in the band just above zero have managed earnings upwards to avoid reporting a loss (Burgstahler & Dichev, 1997)). The band from 0 to 0.2382892 on the distribution curve is thus classified as the EM1 band with the firms placed in this band being considered as EM1 firms.

As seen in ***Table 1***, the bands to the left and right of the EM1 band demonstrated fewer than expected observations. A total of 248 observations were expected in the EM1 band. The raw data however showed a total of 496 observations. The additional 248 observations are therefore suspected to have been the result of firms managing earnings in such a way as to fall into this band. The firms below are assumed to have managed earnings upwards to prevent a loss, resulting in 225 observations as opposed to the 475 expected observations (Rabin and Negash, 2012). In addition, the band to the right of the EM1 band has 65 observations less than expected. This indicates that within the EM1 band may be a mix of firms who have managed earnings both upwards and downwards. The firms identified by Rabin and Negash (2012) as being within the EM1 band were used as the sample of EM1 firms in the present research.